Result Page

[0001] The present invention relates to a process of treatment of polypropylene fibres for the reinforcement of shaped fibre-cement products, as well as fibre thus treated and the fibre-cement products reinforced by this fibre.

[0002] One makes out of fibre-cement of the shaped solid products most various such as, inter alia, of the frontage and roofing units such as slates, plates planar or corrugated, tubes and tanks storage.

[0003] These shaped solid products are manufactured with the departure of an aqueous suspension at taken hydraulic comprising hydraulic binders, fibres of reinforcement and optionally of the loads. This aqueous suspension is mixed in order to obtain a distribution in uniform substance of the components. The suspension is then drained. The fresh product thus obtained can then be shaped, for example in the shape of planar plate, plates corrugated or in the shape of tube. Thereafter, one lets harden the shaped fresh product under atmospheric conditions or else still under conditions of pressure, temperature and moisture specific.

[0004] The most widespread manufactoring process is the Hatschek process, whose technology, applied with the origin with the asbestos cement, is described exhaustively in the work "Asbestzement" of Harald Klos (Springer Verlag, 1967). Other manufactoring processes are, for example, the Magnani processes, Mazza, Flow one, of extrusion and injection.

[0005] The Hatschek process is based on the use of machines of draining to cylindrical sieve. In this process, a mat coming of a diluted cement and asbestos suspension contained in a vat is transferred to a felt, via a cylindrical drainer, and is then rolled up until the required thickness using cylinders of forming. For the manufacture of corrugated sheets, the formed asbestos cement sheet on the cylinder of forming is distinct and detached of this cylinder after the desired thickness was reaching. This sheet is then shaped and carrying to be hardened between the shapes in oiled corrugated metal.

[0006] For certain applications it proves to be useful to compress the fresh product after its

shaper but front its hardening (post-compression). One thus makes the distinction between the shaped products out of fibre-cement noncompressed and the shaped products out of fibre-cement compressed. The shaped products out of fibre-cement compressed were compressed between their shaper and their hardening, under an equal or great pressure with 4,9 MPa (50 kgf/cm< 2>). Usually, these shaped products out of fibre-cement compressed were subjected to the fresh state with pressures between 9,8 MPa and 24,5 MPa (between 100 and 250 kgf/cm< 2>).

[0007] The asbestos present as well of the properties of reinforcement due to its strength with the own traction as of the qualities of carrying in work in relation to the excellent ability with dispersion in an aqueous cement suspension. Pendent the stage of draining, because of the good properties of filtration and the good affinity for cement, the asbestos fibres can retain the fine suspended particles of the composite mixture in the course of shaping. In the hydrated final product, the high strength in traction combined with the high modulus of elasticity and low elongation at fracture contribute to confer on the manufactured goods out of asbestos cement their high strength in known inflection.

[0008] However, asbestos became component undesirable for reasons taking with the environment and to health and substantial efforts were devoted to attempts to replace it.

[0009] It is consequently desirable to also use new fibres like agents of reinforcement and like auxiliary of carrying in work being used with the hydraulic binders, for example for the reinforcement of cement.

[0010] There is exposed no natural or synthetic fibre presenting all the properties of asbestos fibres. The strength with alkalis in the solutions saturated with calcium hydroxide is a particular criterion to which the fibres of reinforcement must answer.

[0011] It is still substantial that the fibres can be dispersed easily in a diluted aqueous cement suspension and remain also dispersed uniformly at the time of the contribution of other additives when these fibres must be carrying works about it by the technical ones of draining to give fibre-cement products. The good dispersion of fibres is substantial at the same time so that they do not form agglomerates and that the density of fibres is homogeneous in the finished fibre-cement product, but also so that the fibres are not directed in a common direction.

[0012] Indeed, if the fibres adopted a preferential direction, the fibre-cement product would then have a different strength according to the direction of the breaking load.

[0013] The literature contains already innumerable publications in connection with the use of various natural or synthetic fibres organic and inorganic. The made fibres of cellulose, polyamide, polyester, polyacrylonitrile, polypropylene and poly (vinylic alcohol), inter alia, already made the object of investigations for the reinforcement of cement. In the same way, one knows work on made fibres of glass, steel, aramid and carbon. Among all these fibres, none has

until present all the required properties, specially for cement.

[0014] For example, glass has a low chemical stability, the manifest steel of corrosion and has a too high density, the carbon is too brittle, adheres badly and is high price, the cellulose has an insufficient durability, and polyethylene and the ordinary polypropylene have a strength in insufficient traction.

[0015] Among fibres of reinforcement currently used, the fibres of polyacrylonitrile (SIDE) and polyvinyl alcohol (PVA) are generally prefered. Separately or in combination, these fibres make it possible to get a shaped fibre-cement product having a strength with the traction raised in combination with an acceptable ductility. Unfortunately, the fibres of SIDE and PVA are expensive and considerably increase the cost price of the fibre-cement products the container.

[0016] The polypropylene fibres, have an excellent strength with alkalis, same at temperatures being able to go until 110 DEGREE C. They are durable and inexpensive fibres. However, it is generally marked that the polypropylene fibres are technically insufficient when it sagit to reinforce materials whose matrix containing cement is relatively brittle.

[0017] One already sought to improve the properties of polypropylene fibres particularly by the incorporation of additives in the mass of fibres. Document JP 6-219797 of Daïwabo Create describes polypropylene bicomposantes fibres containing in their peripheral part of calcium carbonate. In GB-2.030.891, dissimilar particles are enchased by bombardment in thermoplastic fibres.

[0018] Documents GB-2 021.552, WO 94/20654, EP-A-0 240.167, and WO 87/04144 describe products at taken hydraulic whose fibres of reinforcement are carried out with the departure of polymeric modified. The fibres are thus with each time modified in the mass, which involves numerous disadvantages.

[0019] This incorporation of additives in the same mass of polypropylene fibres increases the manufacturing costs and involves a modification of the mechanical characteristics of fibre of reinforcement, particularly into decreasing its tenacity.

[0020] Document EP 0.310.100 also described fibres of polyolefin containing of the inorganic particles enchased in the mass of fibre, none the particles being exposed to the surface of fibre. These fibres are manufactured at the beginning of a film which can have undergone certain surface treatments. The surface treatments mentioned consist of chemical modifications, electric or mechanical of fibre. This document also mentions the application of surfactant at the surface of fibre.

[0021] One still knows stereoregular polypropylene fibres having a strength with raised traction, (EP 0.525.737 of Daïwabo). In patent EP-A-0 537.129 are described solid shaped manufactured

goods out of cement reinforced by this type of polypropylene fibres.

[0022] A problem still encountered in the fibre-cement products in plates reinforced by this type of fibres is the occurrence of cracks in the edges of the plate in particular during the long-term ageing of these products.

[0023] In addition, the work of rupture has a considerable importance for the use of the fibre-cement products. A high value (produced with high ductility) is sought. An high ductility is, moreover, substantial in order to be able, if necessary, to machine the fibre-cement parts: to drill, nail, saw, etc Lastly, safety during the use of the products, such as the roofs, is some also increased, because one thus avoids too rapid or too violent ruptures under load.

[0024] In the noncompressed fibre-cement products, reinforced by polypropylene fibres, the work of rupture has a very low value generally.

[0025] Within sight of the reasons enumerated above, in particular because of their low strength to cracking and their low work of rupture, the use of the products out of fibre-cement compressed and noncompressed, whose fibres of reinforcement are polypropylene fibres, remained until present very limited.

[0026] One can note that certain polypropylene fibres are used, in low quantity, in concrete products, to reduce the cracking of the concrete. One knows for example a fibre marketed under the name Crackstop TM. This type of fibre has insufficient mechanical properties and is thus completely inadequate to reinforce fibre-cement products, such as frontage or roofing units.

[0027] Indeed, the fibre-cement products are characterized by a very large report/ratio surfaces/ thickness. The problem of cracking of such products is thus completely different among that of massive concrete products. In the fibre-cement products, the fibres must actually fulfill a function of reinforcement, whereas in the concrete products, the quantity of fibres is clearly less substantial and does not fulfill actually this function of reinforcement. Moreover, the proportions of the different components, particularly of cement, are very different in the fibre-cement products and the concrete products. In the same way, the conditions of carrying in work and the conditions of use are completely different.

[0028] One has now exposed in a way unexpected and surprising that polypropylene fibres, same ordinary, but having undergone a double surface treatment by treatment corona and by immersion in an aqueous dispersion the polymeric ones, give very good results, i.e. it is possible to carry out a shaped fibre-cement product presenting a good strength, a raised work of rupture, and a good strength with cracking, by means of polypropylene fibres having undergone this surface treatment.

[0029] The purpose of the invention is getting shaped fibre-cement products which avoid the

own disadvantages with the state of technical known.

[0030] One of the purposes of the invention is particularly to get a shaped fibre-cement product presenting of good mechanical properties, such as a work of rupture high and a good strength with cracking, at low cost price.

[0031] The present invention has as an object a polypropylene fibre for the reinforcement of shaped fibre-cement products manufactured by means of a composition at taken hydraulic particularly including/understanding water, binders hydraulic and fibres of reinforcement. The fibres following the invention were activated surfaces some by a corona treatment and include/ understand a deposit of polymeric organic comprising polar groups and preferably comprising olefinic monomers, this deposit having been applied by surface treatment using an aqueous dispersion of this polymeric

[0032] Preferably, the corona treatment is carried out in preprocessing immediately front the immersion of fibres in aqueous dispersion.

[0033] In this text, one as well understands by dispersion a dispersion of solid in liquid, as an emulsion of liquid in liquid.

[0034] Following an embodiment, the aforementioned dispersion aqueous comprises, single or in mixture, polymeric organic selected among the homopolymers and copolymers of olefinic monomers modified after synthesis (for example by grafting) by polar groups.

[0035] The said polar groups are chosen, for example, among maleic anhydride, the acrylic acid, or the methacrylic acid.

[0036] The aforementioned aqueous dispersion can also comprise, single or in mixture, polymeric organic selected among the homopolymers and copolymers of olefinic monomers modified by oxidation.

[0037] The aforementioned dispersion can still comprise, single or in mixture, polymeric organic selected among copolymers of an olefinic monomer and a polar monomêre, such as, for example, the methacrylic acid and the acrylic acid, optionally neutralized by ions.

[0038] Of a beneficial manner, the polypropylene fibres having undergone the aforementioned treatment include/understand from 0.05 to 5% in weight and preferably from 0.15 to 1.5% in weight of the said deposit of polymeric organic comprising polar groups, compared to the fibre weight.

[0039] The following polypropylene fibres the invention, have, of prefered manner, a sum of money (D) ranging between 0.5 and 10, and of manner even more prefered between 0.5 and 2.

[0040] The fibres can be cut preferably in length being able to go from 2 to 20 mm; preferably the length of fibres spreads out from 5 to 10 Misters. The section of fibres can be circular or of irregular form, for example in ton of X or Y. The fibres can be creped while they are drawn or after. The technical one of creping of fibres can include operations such as false torsion, the treatment of tangle per draught (including/understanding treatment TASLAN) or the treatment by compression (with being known with the box of stuffing).

[0041] The fibres following the invention can also be obtained by fibrillation of an extruded polypropylene film. The fibres can then present the shape of ribbon.

[0042] The fibres of reinforcement can be obtained at the resin beginning of any type of polypropylene currently used.

[0043] Polypropylene fibres, or a part of polypropylene fibres, can optionally include/understand loads. They can optionally include/understand, moreover, an agent of hydrophilizing such as a salt of alkali metal of alcoylphosphate, such as a potassium or sodium salt, comprising preferably from 8 to 18 carbon atoms.

[0044] Following an alternative of execution, the fibres following the invention, or a part of fibres following the invention, can consist of highly crystalline polypropylene having, for example, a strength with the great rupture with the fibre state with 490 N/mm< 2>, a report/ratio of the molecular weight mean in mass with the molecular weight mean of number (Q) < to 4,5, a content of insoluble components (HI) ranging between 97 and 100 and one isotactic fraction of pentades in moles (IPF) ranging between 94 and 100.

[0045] Following another form of execution of the invention, the fibres of reinforcement, or a part of fibres of reinforcement, can be polypropylene bicomposantes fibres, consisting, for example, in a core and an outer layer, whose outer layer contains carbonate particles of alkaline earth metals, such as for example, calcium carbonate, magnesium carbonate or their mixtures.

[0046] The present invention also has as an object a process of surface treatment polypropylene fibre for the reinforcement of fibre-cement products; this process comprising a corona treatment, preferably in preprocessing, and an immersion of polypropylene fibres in an aqueous dispersion the polymeric organic ones comprising, preferably, of the olefinic monomers and comprising polar groups.

[0047] Of a beneficial manner, the corona treatment consists in making pass fibres with a tape speed ranging between approximately 10 and 300 metres per minute and of prefered manner between approximately 30 and 150 m/min. in an electric discharge. In particular, this discharge can be created between an electrode carried with high tension (10 to 25 kVolts) and high frequency (10 to 40 Khz) and a cylinder connected to the ground.

[0048] A prefered manner, the concentration of the aqueous dispersion of the treatment bath is 0.5 to the polymeric 40% organic ones.

[0049] Of a manner particularly beneficial, the aforementioned surface treatment is carried out by carrying in contact of fibres with a roller plunging applicator in a treatment bath comprising the aforementioned aqueous dispersion. All other forms of treatment can be considered such as the applications by steeping, sprinkling, or curtain.

[0050] Following the technical one used for the surface treatment, the concentration of dispersion must be adjusted. For treatments by baths, aqueous dispersion preferably has a concentration into polymeric organic ranging between 0.5 and 10% out of dry matters. For surface treatments by sprinkling, of the prefered concentrations of dispersion for example lie between 10 and 40% out of dry matter.

[0051] The double following surface treatment the invention can be carried out, with the choice, front, pendent or after the step of drawing of fibres. Following the case, the treatment is carried out on hot or cooled fibres.

[0052] Several surface treatments can optionally be envisaged during the manufacture of fibres of reinforcement. Generally, the treatment bath can be controlled between 20 and 80 DEGREE C.

[0053] The present invention has also as an object of fibre-cement the shaped products comprising of fibres of reinforcement as described above and of fibres of reinforcement treated by the process describes above.

[0054] Of prefered manner, the fibre-cement products include/understand from 0.3 to 4% and still prefered manner from 0.5 to 2.5% in weight compared to the initial total dry mixture, of following polypropylene fibres the invention.

[0055] The according fibre-cement products with the invention can in addition include/ understand inorganic fibres or other organic fibres that the following polypropylene fibres 1 invention.

[0056] Organic examples of fibres being able to be used in combination with treated polypropylene fibres are the fibres of polyacrylonitrile, of poly (vinylic alcohol), of polyamide, polyester, aramid, carbon and polyolefins.

[0057] Inorganic examples of fibres being able to be used in combination with treated polypropylene fibres are the glass fibres, the rockwool, slag the wool, the fibres of wallastonite, the fibres of ceramic and analogues.

[0058] For reasons of simplicity, it is refers to cement like prefered binder in present description. However, all the other binders at taken hydraulic can be used instead of cement. The binders with taken hydraulic suitable are to be heard as being materials which contain inorganic cement and/or a binder or adhesive inorganic which hardens by hydration. Binders particularly suitable which harden by hydration are particularly, for example, Portland cement, cement with high content alumina, Portland cement of iron, the trass-cement, cement of slag, the plaster, the formed silicates of calcium by treatment the autoclave and the combinations of particular binders.

[0059] The most various loads and additives which, for example, can improve the behavior of draining of the suspensions on the machines of draining, are frequently added to the binders. Possible additives are materials such as flying ashes, amorphous silica, ground quartz, the ground rock, the clays, the slags of blast furnace, the carbonates, pozzolanas, etc The total quantity of loads is, preferably, less to 50% in weight compared to the initial total weight with the dry state of the product.

[0060] The following product the invention can still comprise, moreover, of fibres of carrying in work preferably, an equal or less quantity at 10% in weight compared to the initial total weight with the dry state of the product.

[0061] The following product the invention can, for example, being a roofing unit or frontage, such as a planar plate, a corrugated plate, or all other accessory elements of various forms.

[0062] The invention is described hereafter in a more detailed way using particular examples of realization.

EXAMPLES

[0063] In the following examples, fibre-cement products compressed (example 1) or not compressed (example 2), reinforced by treated following polypropylene fibres the invention, are compared with fibre-cement products carried out with

a) untreated polypropylene same fibers,
b) same fibers having undergone only one corona treatment
c) same fibers having undergone only one treatment in a bath of emulsion.

Treatment bath used:

Bath (1): Composition MICHEM TM emulsion 94340-E of Michelman Int' L & Co., diluted with water, until a concentration of dry matter 4%.

This one is an aqueous dispersion comprising of grafted polypropylene with maleic anhydride of the type Epolene TM E-43 from Eastman Chemical. Dispersion has the following features:

emulsifier agents: nonionic
cut average particles: 40 Nm
pH: 7.5 - 9.0

Other baths could be used such as for example:
Bath 2): composition N DEG M 59840 of Michelman Int' L & Co., diluted with water until a concentration of dry matter 4%, to which at summer added 0.1% of surfactant of the type Silwet TM L-77 of OSI Specialities.

Composition N DEG M 59840 is an aqueous dispersion comprising a ethylene-propylene copolymer grafted with maleic anhydride of the type AC TM X 597 of Al Signal.
Bath 3): composition N DEG M 93935 of Michelman Int' L & Co., diluted with water until a concentration of dry matter 4%, to which at summer added 0.1% of surfactant of the type Silwet TM L-77 of OSI Specialities.

The composition M 93935 is an aqueous dispersion comprising a polyethylene high density (HDPE) oxidized type AC TM 392 HDPE of Al Signal. Dispersion has the following features:

emulsifier agents: nonionic
cut average particles: 40 Nm
pH: 9.0 - 10.5

Bath 4): Composition Aquacer 524 of Byk-Cera, diluted with water until a concentration of dry matter 4%.

This one is an aqueous dispersion comprising of grafted polypropylene with maleic anhydride of the type Epolene TM E-43 from Eastman Chemical. Dispersion comprises anion emulsifier agents.
Bath 5): composition Aquacer 841 of Byk-Cera, diluted with water until a concentration of dry matter 4%.

This one is an aqueous dispersion comprising of grafted polypropylene with maleic anhydride of the type Epolene TM E-43 from Eastman Chemical. Dispersion comprises cationic emulsifier agents.
Bath 6): Composition Aquaseal TM 1127 of Paramelt B.V., diluted until a dry matter concentration of 4%.

This composition is an aqueous dispersion of a copolymer of ethylene and methacrylic acid.
Bath 7): Composition Aquaseal TM 1088 of Paramelt B.V., diluted until a dry matter concentration of 4%.

This composition is an aqueous dispersion of a copolymer of ethylene and methacrylic acid neutralized by the ions Na< +> (ionomère).
Bath 8): composition Nuwet TM 500 of OSI Specialities, Inc., with a concentration of 15g/l of solution. This composition comprises 65% of polydiméthylsiloxane at least organic modified, to maximum the 20% of polyalkylene oxide and to maximum the ethoxylated alkyl 20%.
Bath 9): mixture of 0,35% of the composition Silastol TM cut 5A (ester of polyglycole of fatty acid) with a concentration of 15g/l and 0,15% of the composition Silastol TM cut 5B (fatty alcohol phosphate mixture) to a concentration of 4g/l, both of the company Schill and Seilacher.

Preparation of polypropylene fibres

[0065] The granulated ones of standard polypropylene resin (point melting 165 DEGREE C, index of fluidity or "melt flow index" (MFI) of 25) are heated in an extrusion machine (the temperature in end of extrusion machine varying between 240 DEGREE C and 280 Degree C) and spun conventional manner.

[0066] The fibres are then drawn with conventional equipment.

[0067] Following a first method of preparation, the spinning and the drawing of fibres are carried out of discontinuous manner. Following another method of preparation, the spinning and drawing are carried out of continuous manner.

[0068] The fibres have the following features then:

titrate: 1.18 dtex
tenacity: 730 N/mm< 2>
initial modulus: 7460 N/mm< 2>
elongation with the rupture: 19.0 %

[0069] After drawing, the fibres pass uninterrupted in an electric arc created by a machine corona of the type standard Ahlbrandt TM TG100 with the following setting parameters:

tape speed of fibres: 50m/min.
power: 0,8 kWatt
tension: 14 kVolt
electrode spacing: 1,2 Misters.

[0070] The fibres are then impregnated treatment bath (1) described above by contact with a

roller plunging applicator in this treatment bath. The fibres pass then between rollers which express the surplus of dispersion. The quantity of applied dry matter of the treatment bath on fibres by this treatment is approximately 0.15% to 1.5% in weight compared to the fibre weight.

[0071] This concentration is measured by nuclear magnetic resonance (NMR) using a commercial apparatus OXFORD NMR QP 20+. This equipment is used of manner standard to quantify the completions of applied surfaces on fibres, particularly in textile technology. This apparatus is designed to determine the concentration of a determined component, which contains protons in its molecular structure.

[0072] The fibres are then cut of conventional manner to a length of approximately 6 mm front to be used in the material mixtures of construction.

[0073] In this example, the corona treatment and the impregnation with the bath of emulsion are carried out after the drawing of fibres, but it is also possible to carry out these treatments pendent the step of drawing or directly after the spinning, front drawing.

Preparation of the mixtures and carrying in work on Hatschek machine.

[0074] The following compounds are mixed in water:

cement 77.2%,
polypropylene fibre 1.8% treated on the surface with one of the baths described above,
3.0% of refined wood pulp Kraft up to 65 DEG SR (Schopper-Riegler),
amorphous silica 3.0%, and
15% of flying ashes.

[0075] The given concentrations are the concentrations into solid compared to the total dry matter.

[0076] One dilutes this suspension with water until a concentration of 30 G per liter and one then transfers it to the vat from a Hatschek machine.

[0077] Little front the introduction suspension into the vat, one adds 200 ppm of an agent of flocculation of the polyacrylamide type to improve the retention of cement.

[0078] One produces plates using the machine by 22 turns of the cylinder of forming.

[0079] The plates are then pressed between steel moulds oiled in a press under an applied specific pressure of 180 bars (17.7 MPa), up to one thickness average of 5.5 Misters.

[0080] One makes harden the sheets under plastic cover pendent 14 days in a moisture relative of 100% to 20 DEGREE C.

Mechanical tests of strength to the inflection and cracking

[0081] One after carries out the mechanical tests on wet plates i.e. immersion pendent 3 days in water. One first of all determines the strength in inflection of the samples on a mechanical testing machine during a conventional test of inflection on three points.

[0082] The apparatus records the stress-strain curve. The maximum work of rupture under load (IMOR) expressed in joules per m< 2> (J/m< 2>) is integral function stress-strain until the breaking load. The results are presented in table I below.

[0083] One also determines the strength with cracking by a test of ageing (in alternation heat-water) inspired by the standard INTO 492 but made more severe.

[0084] For this purpose, a series of fibre-cement plates manufactured on a Hatschek machine, compressed and left harden under wet atmosphere pendent 14 days as described above are cut out into square of 40 cm * 27 cm. A roof is mounted using 9 plates, of conventional manner, i.e. partially superimposed.

[0085] The test consists in subjecting this roof to 30 6 hours cycles including/understanding

2h55 of heat (70 DEGREE C + 5 Degree C),
5 min. of stop,
2h55 of spraying with a water at ambient temperature (2,5 l/m< 2> .min),
5 min. of stop.

[0086] The slates then are dismounted, piled up and exposed pendent 24 hours to an atmosphere of CO2 100%. The slates then went up in roof and subjected to a new series of 30 cycles 6 hour old heat-water as described above.

[0087] The cracks appearing on the exposed face (not superimposed) of slates measured and are then added for the 9 plates.

[0088] The results are given with table I hereafter.
<Tb>< COUNT> Id=TABLEAU I Columns=4
<Tb>
<Tb> Head Collar 1: Treatments
<Tb> Head Collar 2: Strength MOR (MPa)
<Tb> Head Collar 3: Work of rupture (IMOR) (J/m< 2>)

<Tb> Head Collar 4: Total length of the cracks for 9 plates (cm)
<Tb>< SEP> No< SEP> 20,4< SEP> 5510< SEP> 58
<Tb>< SEP> corona only< SEP> 19.4< SEP> 5550< SEP> 55
<Tb>< SEP> Bath 1 only< SEP> 20,7< SEP> 6020< SEP> 47
<Tb>< SEP> corona and bath 1< SEP> 21.8< SEP> 6530< SEP> 15
<Tb>< /TABLE>

EXAMPLE 2

Preparation of the mixtures and carrying in work on Hatschek machine.

[0089] The same method of preparation that that described for example I is used here, put at hand the fact that the products are not compressed.

[0090] The plates produced using the Hatschek machine are thus directly carrying to be hardened without step of intermediate pressing.

[0091] The mechanical tests are carried out on plates with the dry state, with the air.

[0092] The results are gathered in table II below.
<Tb>< COUNT> Id=TABLEAU II Columns=4
<Tb>
<Tb> Head Collar 1: Treatments
<Tb> Head Collar 2: Strength MOR (Mpa)
<Tb> Head Collar 3: Work of rupture (IMOR) (J/m< 2>)
<Tb> Head Collar 4: Total length of the cracks for 9 plates (cm)
<Tb>< SEP> No< SEP> 16.3< SEP> 380< SEP> 65
<Tb>< SEP> corona only< SEP> 16.4< SEP> 392< SEP> 63
<Tb>< SEP> Bath 1 only< SEP> 17.1< SEP> 1220< SEP> 50
<Tb>< SEP> corona and bath 1< SEP> 18.3< SEP> 1830< SEP> 21
<Tb>< /TABLE>

[0093] For the compressed fibre-cement products (example 1) as for the noncompressed products (example 2), one can deduce from tables I and II above, that the surface treatment of ordinary polypropylene fibres using the bath of polymeric organic, gets for the finished product an increase of the strength and especially of the work of rupture compared to the product whose fibres did not undergo treatment.

[0094] For the products whose fibres underwent a double treatment (corona + bath), the improvement of the work of rupture is still clearly more substantial. This is particularly

surprising since the corona treatment in him same did not show significant improvement.

[0095] In the same way, the measured values total length of the cracks for the or not compressed fibre-cement products compressed whose fibres underwent the treatment by single bath show a reduction in the cracks compared to the product whose fibres were not treated. The improvement of the strength to cracking is on the other hand very labeled for the products whose fibres underwent the double treatment. This result is also very surprising because the single corona treatment did not make significant improvement of the strength to cracking either.

[0096] The invention thus allows with a surface treatment, single and inexpensive, polypropylene fibres, to increase the strength, the work of rupture and to improve the strength with cracking of the fibre-cement products reinforced by these fibres. This treatment can be applied with any type of polypropylene fibre.

[0097] The effects of this treatment are particularly unexpected. In spite of the very short time of contact of fibres with the composition of the treatment bath, the adhesion of the particles on fibre seems to be substantial. These effects are all the more unexpected as, in spite of the mixture of fibres and cement in a large quantity of water and under substantial agitation, during the manufacture of the fibre-cement products, the effect of the treatment of fibres is preserved.

Result Page

1. Polypropylene fibre for the reinforcement of fibre-cement products, characterized in that its surface is made reactive by the combination of a corona treatment and a deposit of polymeric organic comprising polar groups, this deposit being applied by surface treatment using an aqueous dispersion of this polymeric.

2. Fibre following claim 1, characterized in that the aforementioned polymeric organic comprises of the olefinic monomers.

3. Fibre following claim 2, characterized in that the aforementioned polymeric organic is selected among the homopolymers and copolymers of olefinic monomers modified after synthesis by polar groups.

4. Fibre following any of the preceding claims, characterized in that the said polar groups are selected among maleic anhydride, the acrylic acid, or the methacrylic acid.

5. Fibre following any of the preceding claims, characterized in that the aforementioned polymeric organic is selected among the homopolymers and copolymers of olefinic monomers modified by oxidation.

6. Fibre following any of the preceding claims, characterized in that the aforementioned polymeric organic is selected among copolymers of an olefinic monomer and a polar monomer, optionally neutralized by ions.

7. Fibre following any of the preceding claims, characterized in that its sum of money (D) lies between 0.5 and 10.

8. Fibre following any of the preceding claims, characterized in that its length lies between 2 and 20 Misters.

9. Fibre following any of the preceding claims, characterized in that the aforementioned deposit

represents from 0.05 to 5% in dry matter weight compared to the dry matter of fibre.

10. Proceeded of surface treatment polypropylene fibre for the reinforcement of fibre-cement products, characterized in that the polypropylene fibres undergo a corona treatment and are carrying in contact with an aqueous dispersion the polymeric organic ones comprising polar groups.

11. Following process the preceding claim, characterized in that the corona treatment and the treatment in aqueous dispersion are carried out after drawing of the polypropylene filaments.

12. Following process any of the claims 10 and 11, characterized in that the corona treatment consists in concealing to pass fibres in an electric discharge.

13. Following process the preceding claim, characterized in that the aforementioned aqueous dispersion comprises from 0.5 to the polymeric 40% organic ones.

14. Shaped fibre-cement product manufactured by means of a composition at taken hydraulic including/understanding water, binders hydraulic and fibres of following reinforcement any of claims 1 to 9.

15. Shaped fibre-cement product manufactured by means of a composition at taken hydraulic including/understanding water, binders hydraulic and fibres of reinforcement treated with the process of following treatment any of claims 10 to 13.

16. Following product any of the claims 14 and 15, characterized in that it includes/understands from 1 to 5% in weight compared to the initial total dry mixture, of fibres of reinforcement.

17. Following product any of the claims 14 to 16, characterized in that it consists of a corrugated or planar plate.